Digital Wireless

BY STEVE STROH, N8GNJ

Packet Radio and Beyond

N8GNJ Elected to TAPR Board of Directors

As I've reported previously in this column, several vacancies have occurred on the Tucson Amateur Packet Radio (TAPR) Board of Directors. I was asked to fill the unexpired term of former TAPR president Greg Jones, WD5IVD, and after some consideration I accepted. I did so because I believe that TAPR, more than any other organization in amateur radio, has the ability to change amateur radio to meet the challenges it will face in the coming decades. Digital techniques have swept through all other sectors of wireless communications, but the last big change in amateur radio technology was the introduction of packet radio in the early 1980s. I think that amateur radio *must* change and evolve, and do so relatively rapidly. However, it can't, because amateur radio, as a whole, can't agree on what changes should be made.

More than any other organization in amateur radio, TAPR has embraced the changes that have been brought about by the internet. TAPR has had an internet presence for a very long time, and a web presence since the web was popularized in the mid-'90s. TAPR is one of the few organizations in ham radio that recognizes the synergies between the hobby and the internet, not just in "presentation," but also in inter-networking.

TAPR brings some considerable strengths to the discussion of what amateur radio should become and how it can do so. For one, TAPR's Board of Directors consists of "citizen soldiers." All maintain full-time jobs in various technology industries and serving on the TAPR Board is a considerable extra commitment. All are involved in amateur radio digital communications.

Pioneering History

TAPR has done considerable pioneering work in amateur radio digital communications. TAPR's stand on spread-spectrum communications in amateur radio while the FCC was considering

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revising spread-spectrum rules was courageous and, in my opinion, the most forward-looking of all the organizations submitting comments.

Most important, TAPR builds things that ordinary amateurs can make work and do interesting things. TAPR's mantra (not very visible yet, but we're working on it) is "Enabling Technologies." TAPR sees its role as creating technologies and products that enable other changes to take place. An example of this is TAPR is playing a leading role in the use of microcontroller-based devices in amateur radio digital communications. This is very significant because while hardware has increasingly been moving beyond the capabilities of average amateurs to experiment with, software (such as that used to program microcontrollers) has increasingly been moving to *within* those capabilities. TAPR's kits, mailing lists, and no-cost web pages encourage experimentation and the development of new kinds of communications.

An SDR in Your Future?

TAPR plans to begin a serious push to put a software-defined radio (SDR) kit in the hands of many amateurs. The kit will be a small box with three "ports"—power, antenna, and data. All of the control functions, audio in, and audio out come from an attached personal computer. To a much greater degree than has ever been possible previously, the functionality of the radio is entirely determined by software. New modulation techniques, new operational techniques, etc., can be tried easily.

I think it's this last aspect of TAPR that is most relevant to the discussion of how amateur radio can and should evolve in the coming decades. *What* amateur radio *is*, to a large extent, is determined by the equipment that is available to amateur radio operators. If leading-edge equipment isn't available, it doesn't do any good whatsoever to develop new techniques, procedures, and so on. Commercial manufacturers, especially the large companies that currently dominate the amateur radio market, aren't equipped to lead such revo-

lutions. They need volume sales and standardized technology to make a profit. Few small companies can afford to try to pioneer new technology in amateur radio.

That leaves TAPR as something of a hybrid, able to afford risk, and also able to get hardware into the hands of ordinary amateur radio operators. Not that it's easy for TAPR to accomplish these goals. Quite the contrary: TAPR has had its share of failures, projects that had high expectations but ultimately didn't come to fruition. However, TAPR did try, and out of such experiences we learn more for the next time. Too, TAPR is organized such that such failures don't kill the organization.

Inevitably, being a member of the TAPR Board of Directors changes my writing in this column somewhat. For one, I'm no longer able to criticize TAPR publicly because I'll be working on the inside of the organization (although careful readers likely will note that I've been far more of a fan of TAPR than a critic). Plus, I'm forced to keep something of a "firewall" between my writing here and what I do for TAPR. Overall, I think the two roles are complementary, and expect that readers of this column will be better served by my election to the TAPR Board of Directors.

Amateur Radio and Wireless Technical Education

I'm a graduate of DeVry Institute of Technology (1978–80, Columbus, Ohio, then called Ohio Institute of Technology). I recently attended the groundbreaking ceremony for DeVry's newest (21st in North America) campus in the Seattle area. I took a quick glance at the course catalog and there wasn't much in the way of wireless listed—one quarter, lumped in with several other subjects. That wasn't surprising to me. In a recent glance at a course catalog for ITT Technical Institutes (as far as I can tell, DeVry's nearest competitor in electronics-focused, for-profit higher education) I did not see any coverage of wireless technology at all.

If *these* institutions, focused as they are on the practical, functional aspects

of electronics technology, aren't emphasizing wireless, from where are those skills going to come?

It seems to me that amateur radio could have a role to play in institutions such as DeVry Institute of Technology and ITT Technical Institutes which are focused on electronics. Keep in mind that most of what I'll write here is speculation, as I've not held discussions about this with any institutions.

• Study material for amateur radio licensing is easily (and relatively inexpensively [compared to textbooks]) available; no new material would have to be developed.

• A major factor in pursuing an amateur radio license in the past was the code test. Now it is possible to obtain an amateur radio license without the requirement to learn code, and even an Extra Class license requires only a 5 word-per-minute code test.

• Volunteer Examiners can come to each school on a schedule convenient to the students (important because most students of such schools work at least part-time).

• The institution benefits by exposing students to wireless technology in a way that they likely will expand their knowledge on their own. (Many will choose to become and remain active hams.)

• Amateur radio technology is an inexpensive way to introduce students to wireless technology. For example, construction of ham radio kits could be used as lab exercises. For example, TAPR's upcoming Software Defined Radio kit would expose students to digital signal processing, software-hardware integration, and perhaps wireless networking. (The kit will need to connect to a local node to be considered complete.)

• APRS and voice repeaters, possibly located at each school, coupled with low-cost "user access devices" such as portable radios, inexpensive GPS (Global Positioning System) receivers, and simple/cheap interfaces, may well appeal to students.

One other factor: There are relatively few such institutions, so such an effort, at least in its early stages, likely would be reasonably manageable.

More on 802.11

I've touched on 802.11 (a family of standards for wireless Local Area Networks) in several previous columns. Basically, 802.11 is going to become as ubiquitous as Ethernet. I think that amateur

Live APRS maps are available on the internet from several websites, including K4HG's site at <http://www.aprs.net>. You can change the map to show you any regional view in the United States and zoom in or out as you please.

Web Pages of The Month

This month's web pages focus on APRS, the Automatic Position Reporting System and are an excellent example of blending amateur radio and the internet.

<http://www.aprs.net> – The web page of Steve Dimse, K4HG (a fellow TAPR Board member). Displays live APRS data running on a Java applet in your web browser.

<http://www.aprs.org> – The web page for APRS by Bob Bruninga, WB4APR (inventor of APRS). Lots of links, very informative.

<http://www.findu.com> – A web-based interface to the APRS network. APRS data, including weather reports, is stored in a database for easy retrieval. Want to know where a ham friend is wandering? Findu.com may know.

radio should be co-opting 802.11 technology for "its" purposes, and begin doing some of the things that hams do, using 802.11 equipment.

Another Wireless Local Area Network standard that well may have more direct applicability to amateur radio is HomeRF. Where 802.11b (the most common version of 802.11 now in use and being sold) uses direct-sequence (DS) spread spectrum, HomeRF uses frequency-hopping (FH) spread spectrum. (Both operate in the 2.4 GHz license-exempt band.) HomeRF feels that in the home environment "interference" will be common, and FH tends to overcome interference better than DS. It's conceivable that HomeRF technology could be adapted for use in amateur radio—for example, brought down from 2.4 GHz to UHF or 1.2 GHz (or even used in the amateur portions of the 2.4 GHz band—ed.).

I'm very interested in talking to readers who have hands-on familiarity with 802.11 and HomeRF technology. I'm particularly interested in talking to those who have some knowledge of "802.11AX," which is rumored to be an adaptation of 802.11 technology for use in amateur radio.

Major Events On My Calendar

Dayton Hamvention (Dayton, Ohio), May 18–20, 2001. Attending Dayton annually has become a habit I'm loath to break, even though it now means a plane trip from Seattle rather than a reasonable drive down from Cleveland as it used to be years ago. This will be my first Dayton as a *CQ* columnist, and I hope to see and report on new and exciting digital products being shown there, making good use of my digital camera. I plan to be around the TAPR and *CQ* booths for at least part of my time there. A major event, as always, is the TAPR PacketBash dinner, and, of course, there are the TAPR and other digital forums.

As always, comments and questions on these and other topics in this column are welcomed.

73, Steve, N8GNJ